

SPARQL RDF Query Language Reference v1.5

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Latest version: <<http://www.ilrt.bris.ac.uk/people/cmdjb/2005/04-sparql/>>

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1. RDF Model and SPARQL RDF Terms Syntax

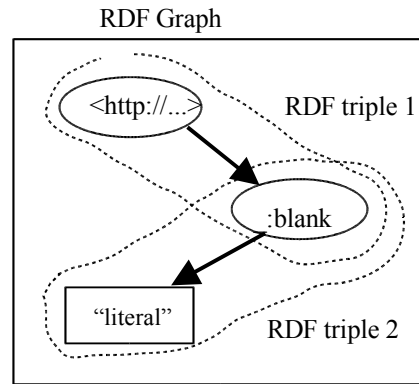
RDF Graph: A set of RDF Triples

RDF Triple: A triple (3-tuple) of:

Subject: URI or Blank Node

Predicate: URI

Object: URI or Blank Node or Literal



URI: An absolute URI which may include a # fragment.
<<http://www.w3.org/>>
<<http://example.org/#fragment>>
<abc.rdf> Relative URI resolved against base URI.
<> Base URI, usually the query document URI.

RDF Literal: A Unicode string with an optional language tag.
"hello"
"bonjour"@fr

RDF Typed Literal: A Unicode string and datatype URI for encoding datatypes.
"abc"^^<<http://example.org/myDatatype>>
abbreviated with an XML QName style as:
"10"^^xsd:integer
Short forms for several common datatypes:
10 "10"^^xsd:integer
1.2e3 "1.2e3"^^xsd:double
true "true"^^xsd:boolean

Blank Node: A node in a graph with a local name. The scope of the name is the RDF graph.
_:node

2. Popular RDF Namespaces

Namespace	Common Prefix	Namespace URI
RDF	rdf:	http://www.w3.org/1999/02/22-rdf-syntax-ns#
Dublin Core	dc:	http://purl.org/dc/elements/1.1/
FOAF	foaf:	http://xmlns.com/foaf/0.1/
XML Schema	xsd:	http://www.w3.org/2001/XMLSchema#
RDFS	rdfs:	http://www.w3.org/2000/01/rdf-schema#
OWL	owl:	http://www.w3.org/2002/07/owl#

3. SPARQL Language Reference

Based on SPARQL WD 19 Apr 2005 <<http://www.w3.org/TR/2005/WD-rdf-sparql-query-20050419/>>.

RDF Term: A part of an RDF Triple. A URI, Blank Node or a Literal.
<uri> _:bl "Literal"@en "abc123"^^my:datatype

Query Variable: Identifiers for binding to RDF Terms in matches.
?a / \$b or in lists: \$name \$title \$place

Triple Pattern: An RDF Triple with Query Variables allowed in each term:
<<http://example.org/abc>> ?x "Hello"
?subject ?predicate ?object

Turtle abbreviations can be used for Triple Patterns, see **Section 4**.

Graph Pattern: A block that matches part of the queried RDF graph.

Basic A set of Triple Patterns which binds RDF Terms in the graph to variables.

Graph Pattern: Written as a { . . } block with '.' separating the triple patterns:

```
{ <http://example.org/abc> ?y "Hello" .  
  ?subject ?predicate "Literal" }
```

Group A graph pattern that contains multiple graph patterns which must all match to provide a result.

Graph Pattern:
{ { ?person rdf:type foaf:Person }
 { ?person foaf:name "Dave" } }

Optional A graph pattern which may fail to match and provide bindings but not cause the entire query to fail. Written with the OPTIONAL keyword before a graph pattern.

```
OPTIONAL { ?person foaf:nick ?nick }
```

Union A pair of graph patterns any of which may match and bind the same variables. Written with the UNION keyword between two graph patterns.

Graph Pattern:
{ ?node ex:name ?name } UNION
{ ?node vcard:FN ?name }

Graph A keyword for specifying a graph name to use or to return a graph name as a binding. Written with the GRAPH keyword before a graph pattern.

```
GRAPH <http://example.org/myfoaf>  
{ ?person foaf:name ?name }  
GRAPH ?graph { ?person foaf:name ?name }
```

Value Constraints: A boolean expression in a graph pattern over query variables that constrains matched graph patterns.
{ ?item ex:size \$size . FILTER \$size < 10 }

4. SPARQL Query Structure

Prologue (optional) BASE <uri>
PREFIX *prefix*: <uri> (repeatable)
Query Result forms (required, pick 1) SELECT (DISTINCT) sequence of ?variable
SELECT (DISTINCT)*
DESCRIBE sequence of ?variable or <uri>
DESCRIBE *
CONSTRUCT { *graph pattern* }
ASK
Query Data Sources (optional) Set the background graph:
FROM <uri>

Add a named graph (repeatable):
FROM NAMED <uri>

Graph Pattern (optional, required for ASK) WHERE { *graph pattern* }

Query Results Controls (optional) LIMIT *n*, OFFSET *m*, SORT BY ...

5. SPARQL Query Result Forms

Variable Bindings: A sequence of (set of variable bindings) for each query pattern match.
SELECT *
WHERE { \$a rdf:type \$b }
to ask for bindings for all variables mentioned in the query and
SELECT \$a ?b
WHERE { \$a rdf:type ?b }
to list them explicitly

RDF Graph:

Describe Resources: An RDF graph describing resources either given by URI
DESCRIBE <http://example.org/thing>
or by binding variables using the same syntax as SELECT.
DESCRIBE ?person
WHERE { ?person foaf:name "Dave" }
Build an RDF graph An RDF graph made by substituting variables into a triple template.
CONSTRUCT { ?a foaf:knows ?b }
WHERE { ?a ex:KnowsQuiteWell ?b }
Boolean: True if the query pattern could be answered.
ASK
WHERE { ?a rdf:type foaf:Person }

6. Query Results Controls and Sorting

The optional controls on query results are optionally performed in the following order:

1. DISTINCT to ensure solutions in the sequence are unique
1. ORDER BY ordering solutions sequences by variable or function call:
ORDER BY DESC[?date] ?title ASC[?familyName]
in descending order by date, by title, by familyName ascending
2. LIMIT *n* to restrict the number of solutions to *n*
3. OFFSET *m* to start the results in the solution from item *m*

7. Values – datatypes, expressions and operators

Supported datatypes: RDF Terms, xsd:boolean, xsd:string, xsd:double, xsd:float, xsd:decimal, xsd:integer and xsd:dateTime

Logical operators: Logical: $A || B, A \&\& B, !A$
Comparison ($A \text{ op } B$): $=, !=, <, >, <=, >=$

Arithmetic operators: Unary: $+A, -A$
Binary ($A \text{ op } B$): $+, -, *, /$

RDF operators: Boolean: BOUND(*A*), ISURI(*A*), ISBLANK(*A*), ISLITERAL(*A*)
String: STR(*A*), LANG(*A*), DATATYPE(*A*)

String Match operator: REGEX(*string, pattern* [*flags*])

Extension Functions and Explicit Type Casting: QName(*expression, expression, ...*)

Automatic Type Promotion: from xsd:decimal to xsd:float
from xsd:float to xsd:double

8. Turtle RDF Syntax Reference

Turtle (Terse RDF Triple Language) describes triples in an RDF graph and allows abbreviations. Triple Patterns in SPARQL can use the same abbreviations.

This description is based on Turtle 2004-12-23 from <http://www.ilrt.bris.ac.uk/discovery/2004/01/turtle/>

RDF Terms:

URI <URI> (< is the base URI, often the document URI)
Literal: "string" or "string"@language or ^^< datatype URI >
Blank Node: _: name or [] for an anonymous blank node

@prefix operator: URIs can be written as XML-style QNames by defining a prefix / URI binding:
@prefix dc: <http://purl.org/dc/elements/1.1/> .

Triples: Written as 3 RDF terms with whitespace separating them as necessary, and ' .' between triples:

```
<> dc:title "SPARQL Reference" .  
<> dc:date "2005-04-19"^^xsd:dateTime .
```

, operator: Triples with the same subject and predicate may be abbreviated with ',':
<http://example.org/mybook> dc:title "My Book", "Mein Buch"@de .

; operator: Triples with the same subject may be abbreviated with ';':
<http://work.example.org/> dc:title "My Workplace";
dc:publisher "My Employer" .

[...] operator: A sequence of (predicate object) pairs may be put inside [...] and a blank node subject will be assigned to them:

```
<> dc:creator [ foaf:name "Dave"; foaf:homePage <http:...> ] .
```

[] operator: A blank node:

```
[] a ex:Book [ dc:title "Thing"; dc:description "On the shelf" ] .
```

a predicate: The often-used rdf:type QName may be abbreviated by the keyword a as a predicate:
<> a Foaf:Document .

Integers: Decimal integers 0 or larger can be written directly as literals (type xsd:integer)
<> ex:sizeInBytes 12345 .

(...) collections: RDF collections can be written inside (...) as a space-separated list of the contents:
<> ex:contents (ex:apple ex:banana ex:pear) .

9. Example SPARQL Query

```
BASE <http://example.org/>  
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>  
PREFIX foaf: <http://xmlns.com/foaf/0.1/>  
# This is a relative URI to BASE above  
PREFIX ex: <properties/1.0#>  
  
SELECT DISTINCT $person ?name $age  
FROM <http://rdf.example.org/people.rdf>  
WHERE { $person a foaf:Person ;  
        foaf:name ?name.  
        OPTIONAL { $person ex:age $age } .  
        FILTER ! REGEX(?name, "Bob")  
      }  
LIMIT 3
```